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(54) **Card readers for data processing apparatus**

(57) A reader for reading data stored in a card 1 is provided with a housing 50 having a slit 24 through which the card 1 can be manually inserted and engaged by guides in the housing 50 for movement in a predetermined path to an operative position, a slider member 5 movable within the housing 50 and having a portion 5*b* interposed in the path of the card 1 so as to be engaged by the card 1 and moved thereby, against the force of at least one spring 8, from an initial position to a displaced position upon movement of the card 1 to its operative position, a lock assembly 11, 13 engageable when the card 1 is in its operative position to hold the slider member 5 in its displaced position against the force of the spring 8, and a lock release for disengaging the lock assembly 11, 13 and thereby permitting the spring 8 to return the slider member 5 to its initial position during which the card 1 is propelled outwardly through the slit 24. A roller 27 urged against the guided card 1 within the housing 50 frictionally resists separation of the card 1 from the slider member 5. A muting circuit 70 is made operative as the card 1 moves to and from its operative position in which conductive terminals on the card 1 are engaged with respective contact elements 4 within the housing 50 so as to avoid transmission of the noise resulting from the engagement of the contacts.

FIG. 5

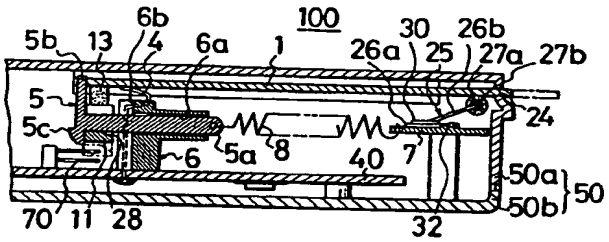

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FIG. 1

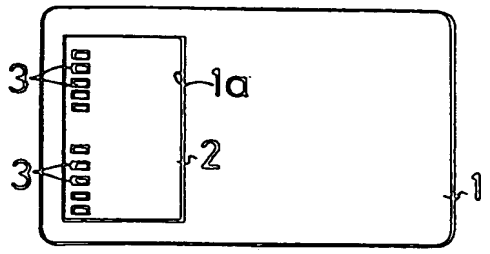

FIG. 2

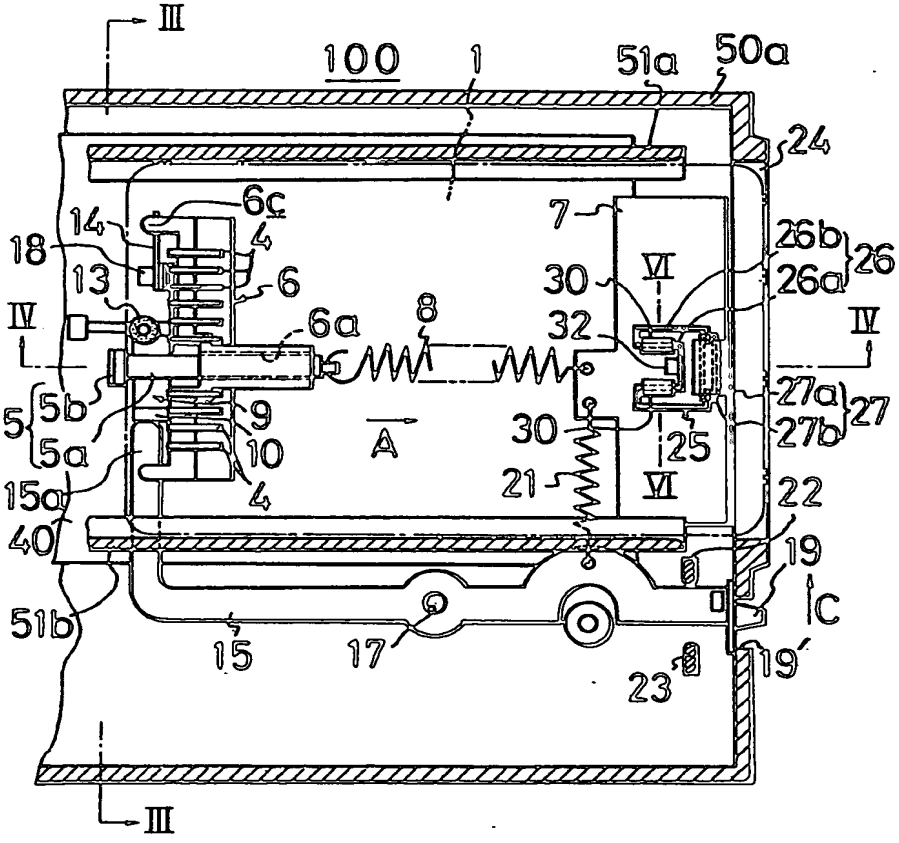

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FIG. 3

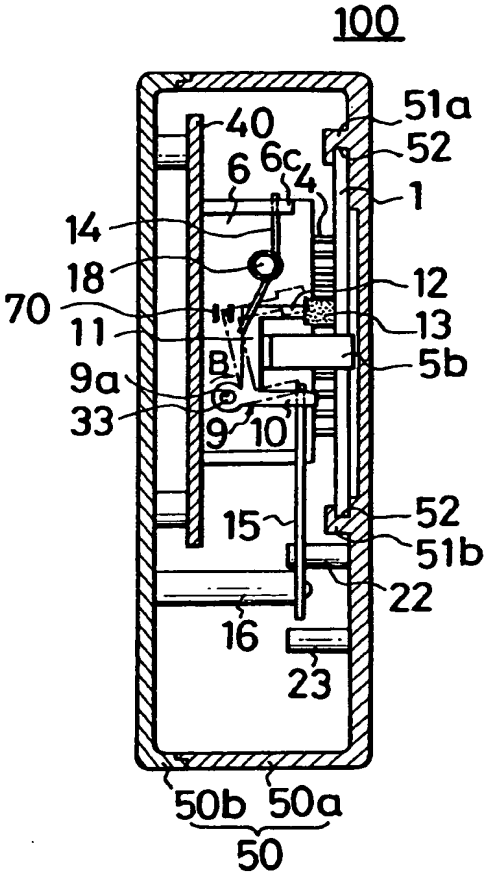

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FIG. 4

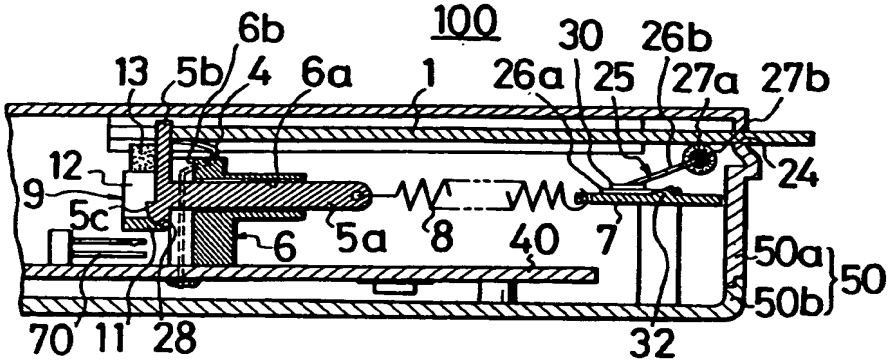

FIG. 5

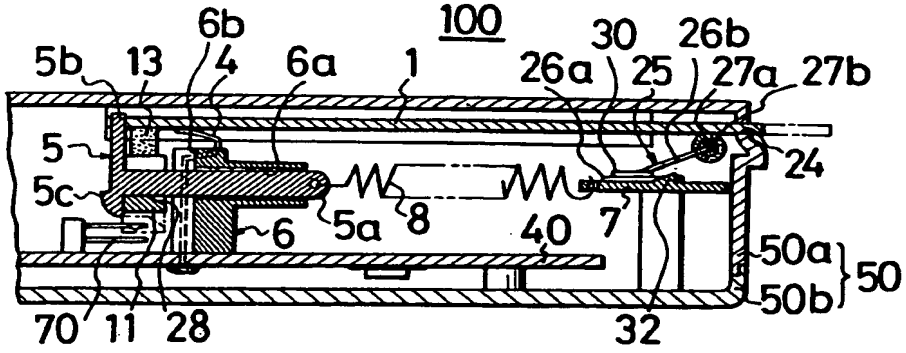

FIG. 6

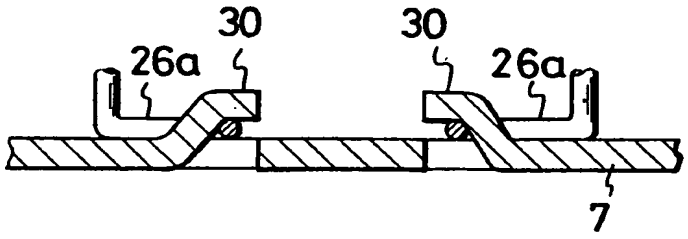
30
30
26a
26a
7

FIG. 7

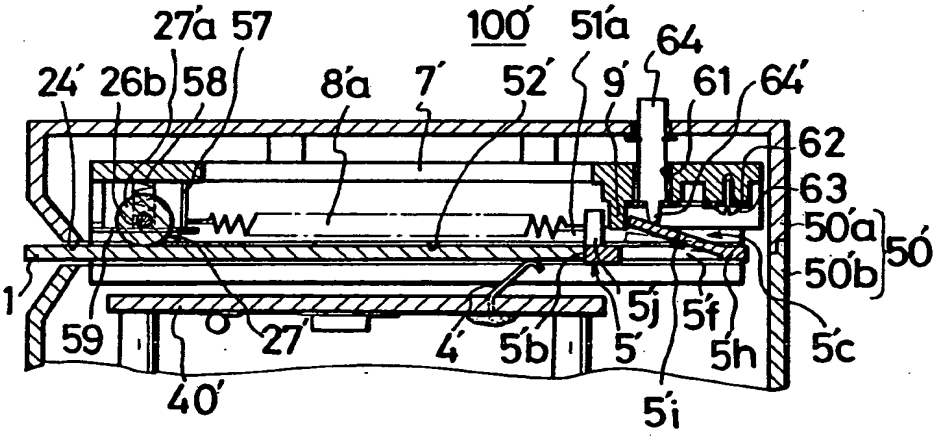
27'a
57
100'
51'a
64
24'
26b
58
8'a
7'
52'
9'
61
64'
62
63
50'a
50'b
50'
1'
59
27'
4'
5'b
5'
5'j
5'f
5'h
5'c
40'
5'i

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FIG. 8

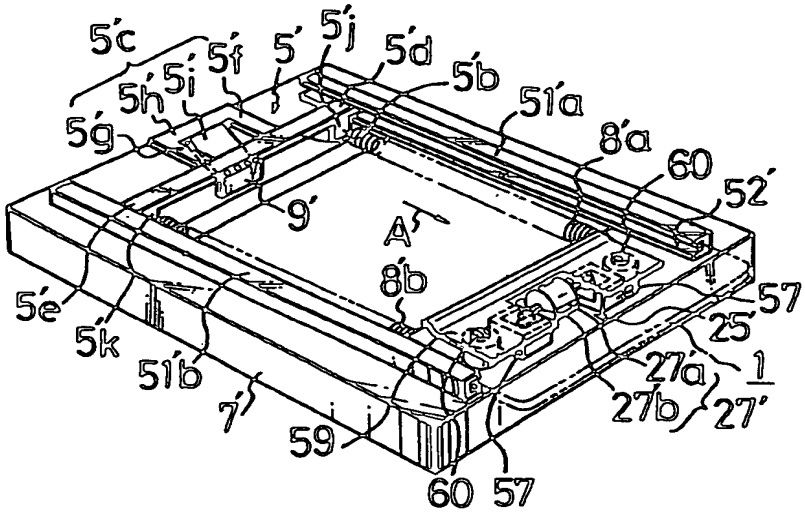
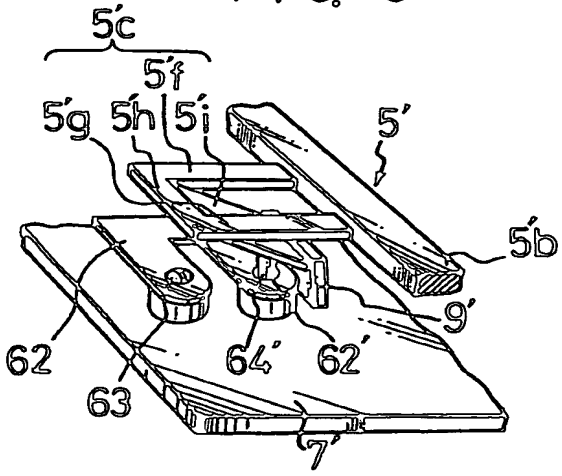


FIG. 9



SPECIFICATION

Card readers for data processing apparatus

This invention relates to card readers for data processing apparatus.

It is known to provide, as a data storage means, a plastics card, generally of rectangular shape and of a size making it conveniently portable. A printed circuit board is sealed in a recess of the plastics card and has conductive terminals arranged in a suitable pattern on an exposed surface of the circuit board. Such conductive terminals are connected, through holes in the circuit board, to respective portions of a printed circuit formed on the other or sealed surface of the circuit board and being connected, in turn, to electrodes of a semiconductor element in which there are incorporated a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM) of the like in the form of an integrated circuit (IC) formed by a metal oxide silicon element (C-MOS).

In a known data processing apparatus for using the above described plastics card as a stored data source, the card is inserted a relatively short distance through a slit provided therefor in a housing, and such insertion of the card is detected either optically or by a mechanical switch so as to cause operation of an electric motor. Operation of the motor serves to drive a card feed roller by which the card is further propelled to an operative position within the housing. The arrival of the card at the operation position is detected by another switch which halts the operation of the card driving motor, whereupon reading out of the data stored in the operatively positioned card is initiated. When it is desired to remove the card from the apparatus, a button is actuated to cause another switch to effect reverse operation of the electric motor by which the card feed roller is made to propel the card out of the housing slit. It will be appreciated that the foregoing device for reading the data storage card is inherently complex and cumbersome, and further is not particularly suited for use in a battery-powered data processing apparatus by reason of its reliance on a motor-driven roller for moving the card to and from its operative position.

According to the present invention there is provided in a data processing apparatus, a card reader for reading data stored in a card, the card reader comprising:

a housing having a slit for the insertion of the card therethrough into said housing;

guide means in said housing engageable with the card for guiding the card in a predetermined path during insertion of the card into said housing to an operative position in said housing;

slider means movable within said housing and having a portion interposed in said path so as to be engaged by the card and moved by the card in one direction from an initial position to a displaced position upon the insertion of the card through said slit to said operative position in said housing;

spring means acting on said slider means and yieldably urging said slider means in a direction opposite to said one direction;

lock means engageable when the card is inserted to said operative position for holding said slider means in said displaced position against the force of said spring means; and

lock releasing means for disengaging said lock means and thereby permitting said spring means to return said slider means to said initial position during which said slider means propels the card out of said housing through said slit.

The invention will now be described by way of example with reference to the accompanying drawings, throughout which like parts are referred to by like references, and in which:

Figure 1 is a plan view of a data storage card of a type which is readable by a card reader according to the invention;

Figure 2 is a sectional view, in a horizontal plane, of a portion of a data processing apparatus viewed from above and having an embodiment of card reader according to the invention for reading the data storage card of Figure 1 which is shown, in dot-dash lines, in its operative position;

Figure 3 is a cross-sectional view taken along the line III—III in Figure 2;

Figure 4 is a cross-sectional view taken along the line IV—IV in Figure 2, but with the data storage card located just short of its operative position;

Figure 5 is a sectional view similar to that of Figure 4, but showing the data storage card in its operative position;

Figure 6 is an enlarged sectional view taken along the line VI—VI in Figure 2;

Figure 7 is a sectional view generally similar to that of Figure 5, but showing another embodiment of card reader according to the invention;

Figure 8 is an inverted perspective view showing some of the elements of the card reader of Figure 7; and

Figure 9 is an enlarged perspective view showing details of the card reader of Figures 7 and 8.

Referring initially to Figure 1, it will be seen that a data storage card 1 of a known type which is intended to be used in a stored data card reader according to the invention is preferably of rectangular shape and of a size making it conveniently portable. The card 1 is preferably formed of a suitable plastics material, for example, polyvinyl chloride, and is formed with a recess 1a in which a printed circuit board 2 is suitably sealed. The circuit board 2 is preferably located adjacent one end of a relatively short side of the rectangular card 1. A plurality of conductive terminals 3 are arranged in a suitable pattern on the exposed surface of the circuit board 2 and are connected, through holes in the circuit board 2, to respective portions of a printed circuit (not shown) formed on the other or sealed surface of the circuit board 2 and connected, in turn, to electrodes of a semiconductor element (also not

shown) in which there are incorporated a central processing unit (CPU), a read only memory (ROM), a random access memory (RAM) or the like in the form of an integrated circuit (IC), for example, formed by a metal oxide silicon (C-MOS), for defining the stored data.

Referring now to Figures 2 to 6, it will be seen that, in a data processing apparatus 100, a card reader according to the invention for reading stored data from the card 1 generally comprises a housing 50 made up of upper and lower portions 50a and 50b, each preferably moulded of a synthetic resin, with the upper housing portion 50a having an aperture or slit 24 in one side, for example, in the side at the right in Figure 2, and being dimensioned to permit the card 1 to be inserted therethrough into the housing 50. The upper housing portion 50a is further shown to be formed with a pair of parallel guides 51a and 51b engageable by the card 1 inserted through the slit 24 for guiding the card 1 in a predetermined rectilinear path to an operative position shown in dot-dash lines in Figure 2. The guides 51a and 51b are preferably formed as parallel, spaced apart channels having substantially U-shaped cross-sections opening towardsceach other to define recesses 52 (Figure 3) in which the opposite longitudinal edges of the card 1 are slidably received.

A slider member 5 is movably mounted within the housing 50 so as to be engageable by the leading end of the card 1 as it is manually moved to its operative position along the path defined by the guides 51a and 51b. More particularly, in this embodiment, the slider member 5 is shown to be of generally T-shaped configuration so as to include an elongate stem 5a and a cap or head extending across one end of the stem 5a and including an abutment portion 5b at one end and a keeper portion 5c at the other end formed with a curved, slanting surface. The elongated stem 5a of the slider member 5 is preferably of non-circular cross-section and is rectilinearly slidable in a similarly cross-sectioned bore 6a of a mounting member 6. The mounting member 6 is suitably secured on a fixed support member 40 within the housing 50 with the axis of the bore 6a parallel to, and approximately midway between the guides 51a and 51b at a location therealong remote from the slit 24. The T-shaped slider member 5 is arranged with its abutment portion 5b extending from the stem 5a normal to the plane of the card 1 guided by the guides 51a and 51b so that the end of the abutment portion 5b is interposed in the path of the card 1. A helical tension spring 8 is connected, at one end, to the free end of the stem 5a and, at its other end, to a mounting plate 7 fixed within the housing 50 adjacent to the slit 24 so that the spring 8 will yieldably urge the slider member 5 relative to the fixed mounting member 6 in the direction of an arrow A in Figure 2 to an initial position (not shown) in which the head or cap of the slider member 5 bears against a surface 6b (Figures 4 and 5) on the mounting member 6 at an end of the bore 6a. When the card 1 is inserted through the slit 24 and manually propelled along the guides 51a and 51b to its operative position (Figures 2 and 5), the leading end edge of the card 1 comes into engagement with the abutment portion 5b of the slider member 5 which is thereby moved from its initial position against the force of the spring 8 to a displaced position at which a latch element 9 co-operates with the keeper portion 5c of the slider member 5 to define a lock assembly for releasably holding the slider member 5 in its displaced position against the force of the spring 8.

As shown particularly in Figure 3, in this embodiment, the latch element 9 includes integral arms 10, 11 and 12 arranged in succession at right angles to each other to provide the latch element 9 with a substantially C-shaped configuration. The latch element 9 has a bore 9a at the corner between the arms 10 and 11 by which the latch element 9 is pivotally mounted on a pin 33 extending from the mounting member 6. A rubber cap 13 is suitably secured on the free end portion of the arm 12 and is frictionally engageable against a side surface of the card 1 adjacent to the inner end thereof when the card 1 is at its operative position. A torsion spring 14 is mounted on a pin 18 extending from the mounting member 6 and has one end in bearing engagement against a lug 6c on the mounting member 6 while the other end of the torsion member 14 acts against the arm 11 of the latch element 9 for urging it in the direction of an arrow B, that is, in the clockwise direction, as viewed in Figure 3. Such angular movement of the latch element 9 by the spring 14 is effective to bring the arm 11 of the latch element 9 into the path of travel of the abutment portion 5c of the slider member 5, as is clearly shown in Figures 4 and 5. Moreover, the arm 11 of the latch element 9 is shown to have an inclined surface 28 thereon for co-operation with the curved, slanting surface of the abutment portion 5c of the slider member 5. Thus, as the slider member 5 is being moved towards its displaced position against the force of the spring 8, the curved, slanting surface of the abutment portion 5c acts on the inclined surface 28 (Figure 4) and deflects the latch element 9 angularly, for example, to the position shown in dot-dash lines in Figure 3, until the slider member 5 attains its displaced position (Figure 5). Angular deflection of the latch element 9 to the position shown in dot-dash lines in Figure 3 moves the rubber cap 13 away from the path of the card 1 so as to avoid interference with movement of the card 1 to its operative position. When the slider member 5 attains its displaced position corresponding to the operative position of the card 1, the torsion spring 14 is effective to return the latch element 9 to the position shown in full lines in Figure 3, and in which the arm 11 of the latch element 9 engages the back of the abutment portion 5c of the slider member 5 for holding the slider member 5 in its displaced position. Moreover, with the arm 11 of

the latch element 9 thus engaged in the back of the abutment portion 5c of the slider member 5, the rubber cap 13 on the arm 12 engages against the side surface of the card 1 for frictionally holding the card 1 in its operative position.

With the card 1 thus disposed in its operative position, the conductive terminals 3 thereof are engaged with corresponding resilient metal contact elements 4 which are insert moulded in the mounting member 6 and connected, as by soldering, to a printed circuit board 40 which forms or is part of the fixed support member 40. Preferably, a muting switch 70 is also mounted on the circuit board 40 adjacent to the latch element 9 so as to be actuable by the arm 11 of the latch element 9 when the latch element 9 is pivoted from the position shown in full lines in Figure 5 to the position there shown in dot-dash lines, for example, by the movement of the abutment portion 5c of the slider member 5 past the latch element 9. In other words, the muting switch 70 is turned OFF so long as the arm 11 of the latch element 9 is moved away from the muting switch 70 by the action of the spring 14 in the latch element 9. Thus, with the card 1 in its operative position, the muting switch 70 is turned OFF and the contact elements 4 fixedly engaging the respective conductive terminals 3 on the card 1 can complete a circuit for reading out the data stored in the card 1 to data processing circuits associated with the circuit board 40. On the other hand, as the card 1 is being moved to and from its operative position, at which times the contact elements 4 are in sliding engagement with the conductive terminals 3 so that a sliding noise would result, the angular displacement of the latch element 9 against the force of the spring 14 for moving the arm 11 to the position shown in dot-dash lines in Figure 5 is effective to turn ON the muting switch 70 and thereby suitably avoid the transmission of sliding noise to the data processing circuits.

As shown particularly in Figure 2, the card reader for reading stored data from the card 1 further comprises a lock releasing means in the form of a lever 15 having a bore 17 intermediate its ends which is pivotally mounted on a support pin 16 extending within the housing 50 from the lower housing portion 50b. One arm of the lever 15 is substantially L-shaped and terminates in an end portion 15a which engages laterally against the arm 10 of the latch element 9. A helical tension spring 21 is connected between the other arm of the lever 15 and the fixed mounting plate 7 for urging the lever 15 to pivot in the direction of the arrow C, that is, in the counter-clockwise direction as viewed in Figure 2, thereby to move the end portion 15a of the lever 15 away from the arm 10 of the latch element 9. Projections 22 and 23 extend from the upper housing portion 50a at opposite sides of the lever 15 (Figures 2 and 3) for limiting the angular displacements thereof. The end portion of the lever 15 remote from the end portion 15a is secured to a knob 19 which protrudes from the housing 50 through an aperture 19' therein. It will be appreciated that the lever 15 is normally urged by the spring 21 to the position shown in Figure 2 in which the lever 15 engages the stop or projection 22 and the end portion 15a of the lever 15 limits the movement of the latch element 9 by the torsion spring 14 to the position shown in full lines in Figure 3. However, when the knob 19 is manually displaced in the direction opposite to an arrow C in Figure 2, the end portion 15a of the lever 15 acts against the arm 10 of the latch element 9 for displacing the latch element 9 to the position shown in dot-dash lines in Figure 3.

The card reader comprises a frictional drag means 25 (Figures 2, 4 and 5) engageable with the card 1 as it is movable along the guides 51a and 51b for frictionally resisting separation of the card 1 from the abutment portion 5b of the slider member 5 when the slider member 5 is held in its displaced position (Figure 5) and also during return of the slider member 5 by the spring 8 to its initial position. More particularly, the frictional drag means 25 is shown to include a roller 27 which is preferably formed by a rubber sleeve 27a secured on a cylindrical core 27b of metal or plastics, and a resilient mounting 26 for supporting the roller 27 adjacent to the slit 24 and resiliently urging the roller 27 against a surface of the card 1 as the card 1 is moved through the slit 24 in the path defined by the guides 51a and 51b. In this embodiment, the resilient mounting 26 for the roller 27 is shown to be in the form of a bent wire spring member having an intermediate U-shaped portion 26a from which parallel arms 26b resiliently extend in a plane that is angularly displaced from the plane of the intermediate portion 26a, as shown in Figures 4 and 5. The free end portions of the arms 26b are bent towards each other and extend into bores at the opposite ends of the core 27b of the roller 27 for rotatably journalling the roller 27. Tabs 30 are struck from the mounting plate 7 to define recesses in which the sides of the intermediate portion 26a of the resilient mounting 26 are engaged, as clearly shown in Figure 6. A claw 32 is also struck from the mounting plate 7 and engages the bight of the intermediate portion 26a for completing the secure attachment thereof to the mounting plate 7. By reason of the angular displacement of the plane of the arms 26b from the plane of the intermediate portion 26a of the resilient mounting 26, the roller 27 is resiliently urged against the card 1 when the card 1 is moved along the guides 51a and 51b for exerting a frictional drag on such movement of the card 1.

The operation is as follows:

The operator of the data processing apparatus 100 manually inserts the card 1 into the housing 50 through the slit 24 with the conductive terminals 3 of the card 1 being disposed at the underside thereof. As the card 1 is manually inserted into the housing 50 in the path established by the guides 51a and 51b, the leading end edge of the card 1 comes into engagement with the abutment portion 5b of the

slider member 5 so as to effect movement thereof from its initial position towards its displaced position against the force of the spring 8. In the course of such movement of the slider member 5, the curved surface of its keeper portion 5c rides against the inclined surface 28 of the arm 11 of the latch element 9 so as angularly to displace the latch element 9 to the position shown in dot-dash lines in Figure 3. Such angular displacement of the latch element 9 withdraws the rubber cap 13 thereon from the path of the card 1 for permitting the final movement of the card 1 to its operative position. When the card 1 attains its operative position, the corresponding movement of the slider member 5 to its displaced position (Figure 5) permits the spring 14 to return the latch element 9 to its engaged positions shown in full lines in Figure 3, and in which the rubber cap 13 bears against a surface of the card 1 and the arm 10 of the latch element 9 engages the back of the keeper portion 5c for holding the slider member 5 in its displaced position against the force of the spring 8. Thus, after the card 1 has been manually moved to its operative position, the operator can release the card 1 which is retained in its operative position by reason of the engagement of the latch element 9 with the keeper portion 5c on the slider member 5, and further by reason of the frictional engagement of the rubber cap 13 and of the rubber surfaced roller 27 with the surface of the card 1 which is thereby held against separation from the abutment portion 5b. As earlier noted, during the final movement of the card 1 to its operative position, the conductive terminals 3 thereon are slidably engaged with the respective contact elements 4, but the muting switch 70 is actuated, in response to angular displacement of the latch element 9 to the position shown in broken lines in Figure 5, so as to avoid the transmission of any sliding noise to associated data processing circuits. Of course, when the card 1 finally attains its operative position and the latch element 9 is returned to the position shown in full lines in Figure 5 for locking the slider member 5 in its displaced position, the muting switch 70 is no longer actuated, so that the fixed engagement of the contact elements 4 with the respective conductive terminals 3 on the operatively-positioned card 1 can serve to transmit data read out of the memory or other elements on the card 1 to the data processing circuits on the circuit board 40.

When it is desired to remove the card 1 from the card reader the knob 19 is manually displaced in the direction opposed to the arrow C in Figure 2 so that the end portion 15a of the lever 15 acts against the arm 10 of the latch element 9 for angularly displacing the latch element 9 to the position shown in dot-dash lines in Figure 3. Such angular displacement of the latch element 9 disengages its arm 11 from the keeper portion 5c of the slider member 5 so that the spring 8 can then act to displace the slider member 5 in the direction of the arrow A in Figure 2 for the return of the slider member 5 to its initial position. During such return of the slider member 5 to its initial position, the abutment portion 5b of the slider member 5 acts against the adjacent end edge of the card 1 for similarly moving the card 1 with the result that an end portion of the card 1 is made to project from the housing 50 through the slit 24. During such movement of the card 1, the roller 27 continues to be resiliently urged against the surface of the card 1 so as to exert a frictional drag upon the movement of the card 1. By reason of the foregoing, rapid movement of the card 1 and its separation from the abutment portion 5b of the slider member 5 with consequent violent ejection of the card 1 from the housing 50 is avoided.

Referring now to Figures 7 to 9 in which parts corresponding to those described with reference to Figures 2 to 6 are identified by the same reference numerals, but with primes appended thereto; it will be seen that, in a data processing apparatus 100', another embodiment of card reader according to the invention has its guides 51'a and 51'b formed as integral parts of a chassis 7' which may be moulded of a suitable synthetic resin. Moreover, in this case, a slider member 5' has opposite end portions 5'd and 5'e which are received slidably in recesses 52' of the guides 51'a and 51'b, respectively. Thus, the guides 51'a and 51'b perform the dual functions of guiding the card 1 inserted through a slit 24' in a predetermined path within a housing 50', and also of guiding the slider member 5' which is engageable, at a surface 5'b, with an end edge of the inserted card 1. The opposite end portions of the slider member 5' have spring anchors 5'j and 5'k integral therewith for attachment to respective ends of helical tension springs 8'a and 8'b which, at their other ends, are suitably attached to the chassis 7' adjacent to the slit 24' so that the slider member 5' is yieldably urged by the springs 8'a and 8'b in the direction of an arrow A in Figure 8.

Moreover, in the embodiment of Figures 7 to 9, the lock assembly for releasably holding the slider member 5' in its displaced position against the force of the springs 8'a and 8'b includes a resilient latch element 5'c integral with the slider member 5', and a fixed keeper element 9' extending from the chassis 7' for engagement with the latch element 5'c. As particularly shown in Figure 9, the latch element 5'c formed integrally with the slider member 5' includes parallel, spaced apart arms 5'f and 5'g extending from the mid-portion of the slider member 5' in the direction away from the surface 5'b engageable by the card 1, and a cross-piece 5'h extending between the arms 5'f and 5'g. An inclined latch finger 5'i extends integrally from the cross-piece 5'h in the direction towards the slider member 5' and, at its free end edge, is engageable with the keeper element 9' which extends into the path of travel of the latch finger 5'i with the slider member 5'.

In the embodiment of Figures 7 to 9, a

frictional drag means 25' is again shown to include a roller 27' formed by a rubber sleeve 27'a secured on a cylindrical metal or plastics core 27'b having journals extending from its opposite ends to be rotatably received in bearing members 57 fixed on the chassis 7'. The bearing members 57 define respective bearing channels extending normal to the plane of the card 1 in the path established by the guides 51'a and 51'b so that, when the journals of the roller 27' are received in the channels of the bearing member 57, the roller 27' can move towards and away from the plane of the card 1 while being constrained from moving in the direction along the card 1. Springs 58 (Figure 7) are disposed in the channels of the bearing members 57 to act on the respective journals of the roller 27' for urging the roller 27' against the card 1. A cover 59 is secured over the channels of the bearing members 57, as by screws 60 (Figure 8) for holding the journals of the roller 27' in the channels of the bearing members 57 against the forces of the springs 58.

As shown particularly in Figure 7, in this embodiment, the lock releasing means includes a release pin 64 slidable, axially in a bore 61 formed in the chassis 7' and projecting, at one end, from the housing 50'. The other inner end of the release pin 64 has a reduced diameter projection 64' which, in the displaced position of the slider member 5' shown in Figure 7, is engageable with the inclined latch finger 5'i. A leaf spring 62 (Figures 7 and 9) is secured at one end, as by a screw 63, to the chassis 7' and has an aperture 62' adjacent to its other end through which there extends the reduced diameter projection 64' of the release pin 64. The leaf spring 62 is operative to hold the release pin 64 upwardly in the position shown in Figure 7, and in which the upper end portion of the release pin 64 projects a substantial distance out of the housing 50'.

This embodiment operates as follows:

Once again, the card 1 from which stored data is to be read is manually inserted through the slit 24' into the housing 50' with the conductive terminals 3 of the card 1 being disposed at the underside thereof. As the card 1 is inserted into the housing 50' in a path determined by the guides 51'a and 51'b, the leading edge of the card 1 engages the surface 5'b on the slider member 5' so as to propel the slider member 5' along the guides 51'a and 51'b against the force of the springs 8'a and 8'b. As card 1 nears its operative position in the housing 50', the inclined latch finger 5'i rides under the keeper element 9' and is deflected thereby, for example, to the position shown in broken lines in Figure 7. However, when the card 1 attains its operative position so as to dispose the slider member 5' in its displaced position shown in Figure 7, the latch finger 5'i can resiliently return to its normal position with the edge of the latch finger 5'i engaging in the back of the keeper element 9' so as to lock the slider member 5' in its displaced position against the force of the springs 8'a and 8'b. By reason of the frictional drag exerted on the card 1 by the roller 27', the card 1 remains in its operative position against the slider member 5' so as to maintain engagement of the conductive terminals 3 of the card 1 with the respective contact elements 4' extending from circuit board 40'. Thus, information or data stored in the memory or memories of the card 1 can be read out and processed by data processing means associated with the circuit board 40'.

When it is desired to remove the card 1 from the housing 50', the release pin 64 is manually depressed so that its projection 64' will deflect the latch finger 5'i to the position shown in broken lines in Figure 7 and thereby release the latch finger from the keeper element 9'. Upon such release of the latch finger 5'i from the keeper element 9', the springs 8'a and 8'b are free to return the slider member 5' to its initial position and thereby propel the card 1 along the guides 51'a and 51'b out of the slit 24'. Of course, during such movement of the card 1, the roller 27' again exerts a frictional drag thereon to ensure that the card 1 will not be violently ejected from the housing 50'.

Of course in the embodiment of Figures 7 to 9, the positions of the keeper element 9' and the latch element 5'c can be reversed. In other words, the keeper element 9' can be integrally formed on the slider member 5' while the latch element 5'c is integrally formed as part of the chassis 7'. In that case, the lock release pin 64 can be arranged to release the latch element 5'c from the keeper element 9' in response to the exertion of an upward pull on the release pin 64.

The data processing apparatus 100 or 100' embodying a card reader according to this invention for reading stored data from a card 1 may further include, for example, a timer circuit, a sound synthesizer, an amplifier, a loudspeaker, a time setting knob and an operating knob (all not shown). In such case, the IC element of the card 1 may be in the form of a memory storing various kinds of information sound or audio data and a synthesizer. When such a card 1 is loaded in the data processing apparatus 100 or 100', the operating knob may be manipulated to select a predetermined information sound to be emitted from the loudspeaker when the timer circuit detects the arrival of a preset time. Similarly, the card 1 loaded in the apparatus 100 or 100' may have, in its memory, data corresponding to the time differences between various cities. In such case, by manipulation of the operating knob, the apparatus may be made to display or announce the times in any selected cities.

The foregoing are, of course, only illustrative of the possible uses of card readers according to the invention for reading data storage cards 1, and many other applications such card readers will be readily apparent.

Claims

1. In a data processing apparatus, a card reader

for reading data stored in a card, the card reader comprising:

a housing having a slit for the insertion of the card therethrough into said housing;

guide means in said housing engageable with the card for guiding the card in a predetermined path during insertion of the card into said housing to an operative position in said housing;

slider means movable within said housing and having a portion interposed in said path so as to be engaged by the card and moved by the card in one direction from an initial position to a displaced position upon the insertion of the card through said slit to said operative position in said housing;

spring means acting on said slider means and yieldably urging said slider means in a direction opposite to said one direction;

lock means engageable when the card is inserted to said operative position for holding said slider means in said displaced position against the force of said spring means; and

lock releasing means for disengaging said lock means and thereby permitting said spring means to return said slider means to said initial position during which said slider means propels the card out of said housing through said slit.

2. A card reader according to claim 1 further comprising frictional drag means engageable with the card in said path for frictionally resisting separation of the card from said slider means when said slider means is held in said displaced position and during return of said slider means to said initial position.

3. A card reader according to claim 2 wherein said frictional drag means includes a rotatable roller, and means mounting said roller adjacent to said slit at one side of said path and resiliently urging said roller against a surface of the card in said path.

4. A card reader according to claim 3 wherein said means mounting said roller includes a bent wire spring member having end portions on which said roller is rotatably journalled and an intermediate portion angularly displaced from said end portions, and support means to which said intermediate portion of said spring member is secured so that the angular displacement of said end portions relative to said intermediate portion achieves said resilient urging of said roller against the card.

5. A card reader according to claim 3 wherein said means mounting said roller includes journals extending from the opposite ends of said roller, fixed support means including spaced apart bearing members defining bearing channels extending normal to the plane of the card in said path and rotatably receiving said journals while permitting bodily movement of said roller towards and away from said path, and springs in said bearing channels acting on said journals for effecting said resilient urging of said roller against said surface of the card.

6. A card reader according to claim 1 wherein the card includes printed circuit means connecting data storage means on the card to a pattern of conductive terminals; and said card reader further comprises contact elements, and means supporting said contact elements within said housing in a pattern corresponding to said pattern of the conductive terminals so as to be engageable with the respective conductive terminals when the card is in said operative position thereof.

7. A card reader according to claim 6 wherein said means supporting said contact elements includes a fixed support member having mounting means thereon in which said slider means is linearly movable.

8. A card reader according to claim 6 comprising muting means made operative upon the movement of the card to and from said operative position while said terminals and said contact elements are in sliding contact with each other.

9. A card reader according to claim 8 wherein said lock means includes a latch element pivoted for movement between engaged and disengaged positions, a spring urging said latch element to said engaged position, and a keeper on said slider means engageable with said latch element to move said latch element to said disengaged position in response to movement of said slider means towards said displaced position, said keeper being engaged by said latch element in said engaged position when said slider means attains said displaced position for holding said slider means in said displaced position; and wherein said muting means includes a muting switch actuable by said latch element in said disengaged position of said latch element.

10. A card reader according to claim 9 wherein said lock releasing means includes a manually actuable releasing element movable for pivotably displacing said latch element from said engaged position to said disengaged position so as to release said keeper and simultaneously actuate said muting switch.

11. A card reader according to claim 1 wherein said guide means for guiding the card in said path also guides said slider means in its movement between said initial and displaced positions.

12. A card reader according to claim 11 wherein said lock means includes a resilient latch element integral with said slider means and normally extending from said slider means at an angle to said path, and a fixed keeper element projecting towards said path and flexing said latch element as said latch element moves past said keeper element in correspondence to movement of said slider means to said displaced position whereupon said latch element returns to its normally extending conditions and engages said keeper element for holding said slider means in said displaced position.

13. A card reader according to claim 12 wherein said lock releasing means includes a slidable release pin projecting from said housing and having an inner end abutting said resilient latch element when said slider means is in said

displaced position thereof, said pin being operative, when manually depressed, to flex said resilient latch element out of engagement with said keeper element and thereby permit said spring means to return said slider means to said initial position.

14. In a data processing apparatus a card reader substantially as hereinbefore described with reference to Figures 2 to 6 of the accompanying drawings.

15. In a data processing apparatus a card reader substantially as hereinbefore described with reference to Figures 7 to 9 of the accompanying drawings.

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